IN THE SPECIFICATION

Please **REPLACE** the paragraph beginning at page 5, line 19, as follows:

A1

A system program for supporting basic functions of the robot and the robot controller is stored in ROM of the memory 102. Further, the operation program of the robot which is taught in accordance with an application, and related set data are stored in the nonvolatile memory of the memory 102. Further, RAM of the memory 102 is used for temporary storage of data in various calculation processings which are carried out by the CPU 101.

Please **REPLACE** the paragraph beginning at page 6, line 5, as follows:

A2

--Further, external input/output circuits of the input/output interface 106 are connected to sensors provided at the robot and actuators and sensors at peripheral devices, particularly to a laser oscillator 108 in relation with the invention. A tool unit having a laser nozzle is attached to a distal end of a movable aim of the robot and a laser beam emitted from the laser oscillator 108 is irradiated from a machining nozzle to a workpiece thereby cutting the workpiece.

Please **REPLACE** the paragraph beginning at page 7, line 4, as follows:

A3 cont

In performing a cutting operation at an end face of the workpiece W of a pipe shape by the robot having the tool unit 10, the robot is positioned so that the final axis 1 of the robot movable arm 100 (the rotational center axis of the robot wrist 1a) coincides with a central axis of the pipe-shaped workpiece W and the machining nozzle 2 is located at a cutting position on

A3 Cancel.

the workpiece W. Then, a laser beam is irradiated from the machining nozzle 2 to the workpiece W, while rotating the final axis 1 of the robot movable arm 100 to thereby cut the workpiece W.

Please **REPLACE** the paragraph beginning at page 7, line 16, as follows:

A4

The cutting position in the axial direction of the workpiece W (left and right direction in FIG. 2) can be selected to some degree by moving the position of the robot wrist la in the left and the right direction in FIG. 2. However, there is limit to the a diameter of the workpiece W which can be cut only by rotating the final axis 1 of the robot movable arm by using the tool unit 10. With respect to a pipe having a radius larger than a distance between the rotational center axis of the tool unit 10 (the final rotational axis of the robot movable arm) and the distal end of the machining nozzle 2, that is, larger than a shifting or biasing amount of the machining nozzle, the workpiece cannot be cut by only rotating the final axis 1 of the robot movable arm. In this case, the machining operation must be carried out by totally driving a 1 of the movable area of the robot.

Please **REPLACE** the paragraph beginning at page 11, line 17, continuing at page 12, as follows:

A5 cont

A tool unit 12 according to the third embodiment is constituted by an attaching portion 12a for attaching the tool unit 12 to the robot wrist 1a, an axis 12b in an L shape extended from the attaching portion 12a in parallel with an attaching face of the robot wrist l la

(perpendicular to the final axis 1 of the movable arm of the robot) and bent perpendicularly at a distal end thereof, an additional rotational axis 12c provided at a distal end of the axis 12b, a first additional variable axis 12d connected to the additional rotational axis 12c for expanding and retracting in a direction in parallel with the attaching face of the robot wrist 1a, a second variable axis 12e connected to a distal end of the first variable axis 12d for expanding and retracting in a direction perpendicular to the first additional axis 12d and the machining nozzle 2 attached to a distal end of the second additional variable axis 12e in which a direction of irradiating laser beam is directed in a direction perpendicular to the additional rotational axis 12c (the final axis 1 of the movable arm of the robot).

Please **REPLACE** the paragraph beginning at page 12, line 5, as follows:

When an end portion of a workpiece W of a small pipe is cut, the robot is positioned such that a central axis of the workpiece W to be cut and the rotational center axis of the additional rotational axis 12c are brought to coincide with each other and an end face of the workpiece W to be cut and an end face of the additional rotational axis 12c are opposed to each other. Further, the machining nozzle 2 is positioned at a position for cutting the workpiece W by driving the first and the second additional variable axes 12d and 12e., thereafter, the additional rotational axis 12c is rotated while irradiating the laser beam from the machining nozzle 2 by which the end face of the workpiece W is cut.

Please **REPLACE** the paragraph beginning at page 12, lines 23, as follows:

A7

According to the third embodiment, when the workpiece W is cut, the plurality of axes of the robot movable arm are not driven and the robot per se stays in a stationary state and holds predetermined position and posture. The machining accuracy is improved since the plurality of axes of the movable arm are is not driven.

Please **REPLACE** the paragraph beginning at page 13, line 1, as follows:

A8

According to the above-described embodiments other than in the case of carrying out the machining method shown in FIG. 5, the direction of irradiating laser beam of the machining nozzle 2 is in a direction perpendicular to the peripheral face of the workpiece W and the cut face is perpendicular to the peripheral face of the workpiece W. Thus, only a section perpendicular to the central axis of the pipe-shaped workpiece W is obtained. When a pipe is cut in a saddle shape and the cut in the saddle shape is brought into contact with the peripheral face of another pipe, as shown in FIG. 11, for carrying out welding of the saddle shape, the cut face perpendicular to the peripheral face of the pipe provides a joint state as shown in FIG. 12a to make the welding operation difficult and welding of high strength is not obtained. However, if the cut face having an arbitrary angle that is relative to the surface of the pipe can be obtained, as shown in FIG. 12b, the cut face and the peripheral face of the other pipe are brought into close contact with each other and welding at the joint position becomes facilitated and solid.

Please **REPLACE** the paragraph beginning at page 13, line 16, as follows:

A8

Hence, a description will be given on a fourth embodiment in which a cut face having an arbitrary angle that is relative to a peripheral face of a pipe is obtained, referring to FIG. 8.

Please **REPLACE** the paragraph beginning at page 14, line 7, as follows:

A9

When operation of cutting a saddle shape is carried out on a workpiece W of a pipe shape, the robot is positioned such that the central axis of the workpiece W of a pipe shape and the final rotational axis 1 of the movable arm of the robot are brought to coincide with each other and the robot wrist 1a and an end face of the workpiece W are opposed to each other. The rotational axis 13c is positioned at a rotational angle to provide an angle of a cut face in starting cutting operation, while the machining nozzle 2 is positioned at a cut start position by driving the first and the second variable axes 13d and 13e. Further, in accordance with a taught program, while rotating the final axis 1 of the movable arm of the robot, in synchronism with this rotation, the rotational axis 13c and the first and the second additional variable axes 13d and 13e are controlled to be driven such that there is carried out cutting operation providing the workpiece W with an arbitrary cut shape such as a saddle shape peripheral a hole. Further, also the fourth embodiment can also cut a workpiece which is not constituted by a single plane such as a pipe having a section in a cylindrical shape, a pipe having a section in an elliptic prism shape, or a pipe having a section in a square prism shape.

Please **REPLACE** the paragraph beginning at page ~~15~~ 14, line 24, continuing at page 15, as follows:

AAlthough the above-described fourth embodiment is restricted by a size (diameter) of the workpiece W to be machined, FIG. 9 shows a fifth embodiment alleviating the restriction-According to a tool unit 14 used in the fifth embodiment, the axis 13b according to the fourth embodiment is changed to a variable axis 14b. The fifth embodiment is provided with an attaching portion 14a for attaching the tool unit 14 to the robot wrist 1a, a first additional variable axis 14b extended from the attaching portion 14a perpendicularly to the final axis 1 of the movable arm of the robot where a distal end thereof is linearly moved, a rotary or pivoting axis 14c four angularly moving a second additional variable axis 14d relative to the first additional variable axis lob and further provided with a third additional variable axis 14e connected perpendicularly to a distal end of the second additional variable axis 14d for linearly moving its distal end and the machining nozzle 2 attached to a distal end of the third additional variable axis 14e. Each of the above-described first, second and third additional variable axes 14b, 14d and 14e is constituted by a structure in which its distal end can linearly be moved by a mechanism of converting rotational movement of a motor or a ball screw into linear movement.

Please **REPLACE** the paragraph beginning at page 15, line 16, as follows:

AA difference between the fifth embodiment and the fourth embodiment resides in whether or not the axis 14b (13b) extending from the attaching portion 14a (13a)

perpendicularly to the final axis 1 of the movable arm is linearly moved, as mentioned above. As is apparent by comparing FIG. 8 with FIG. 9, in view of a change in the diameter of the workpiece, in view of inclination of the cut face, and also in view of a degree of freedom of a distance from the end face of the workpiece to the cut position, the fifth embodiment, where one additional variable axis is increased, becomes facilitated in dealing with the machining operation.

Please **REPLACE** the paragraph beginning at page 15, line 25, continuing at page 16, as follows:

--FIG. 10 shows a sixth embodiment of the invention. According to the sixth embodiment, there is provided a tool unit which is easy to position and hold a pipe of a machining object relative to the tool unit (relative to the robot wrist). According to the sixth embodiment, on an attaching portion 15a of a tool unit 15 for attachment to the robot wrist 1a, there is attached a boss 15z in a shape of a frustum having a center axis in coincidence with the rotational center axis of the tool unit 15 (the final rotational axis 1 of the robot movable arm), and the boss 15z is brought to be opposed to a workpiece W of a pipe like shape. Further, the boss 15z is made rotatable to a main body of the tool unit 15. The robot is positioned such that the central axis of the pipe of the workpiece W coincides with the final rotational axis 1 of the movable arm of the robot (center axis of the robot wrist 1 a, rotational center axis of the tool unit 15), the robot wrist is moved parallel along the axis to thereby press to fit the boss 15z to the pipe W of the workpiece such that the central axis of the pipe W is not deviated from the

A12 cancel.

rotational axis of the tool unit 15. Further, while rotating the final axis 1 of the movable arm of the robot and rotating the tool emit 15, the workpiece is cut or drilled by the machining nozzle 2. When the tool unit 15 is rotated, although the boss 15z is rotated relative to the tool unit main body, the boss 15z is not rotated relative to the pipe of the workpiece W, and accordingly, while no hindrance is produced in rotating the tool unit main body 15, the pipe W is cut or a hole is formed therein such that the rotational center axis of the tool unit 15 coincides with the rotational center axis of the pipe W and therefore, high accurate machining operation can be carried out.--

Please **REPLACE** the paragraph beginning at page ~~14~~ 16, line 24, as follows:

A13

--Although FIG. 10 provides an example of attaching the boss 15z to the second embodiment shown in FIG. 3, the boss 15z is applicable also to the tool units according to the first through the fifth embodiments mentioned above.--

Please **REPLACE** the paragraph beginning at page 23, line 1, as follows:

A14 cont.

--According to the present invention, a workpiece of a pipe shape can be cut only by rotating a final axis of a movable arm of a robot and without driving other movable arms of the robot. Accordingly, machining operation having high machining accuracy can be carried out. Further, by providing a linear movement axis or a rotary or pivoting axis at a tool unit, the machining for forming a hole or the saddle shape cutting on a workpiece of a pipe shape an be